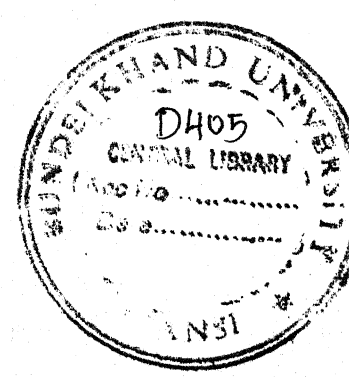
THE ROLE OF THERAPEUTIC LAPAROSCOPIC INTERVENTION IN NON-ACUTE INTESTINAL PATHOLOGIES

Thesis

For

Master of Surgery

(GENERAL SURGERY)



BUNDELKHAND UNIVERSITY,
JHANSI (U.P.)

2004

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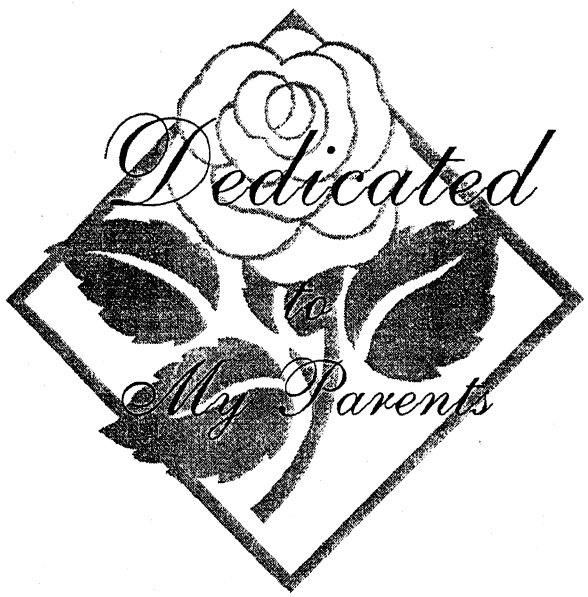

" Let craft, ambition, spite,
Be quenched in reason's night,
Till weakness turn to might,
Till what is darkness be light,
Till what is wrong be right "

Department of Surgery,
MLB Medical College,
Jhansi

CERTIFICATE

This is to certify that the work entitled **"The Role of Therapeutic Laparoscopic Intervention In Non-Acute Intestinal Pathologies"** has been carried out by **Dr. Vikas Singh** himself in this department.

He has put in the necessary stay in the department as required by the regulations of Bundelkhand University.

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CERTIFICATE

This is to certify that the work entitled **"The Role of Therapeutic Laparoscopic Intervention In Non-Acute Intestinal Pathologies"** has been carried out by **Dr. Vikas Singh** himself in this department under my constant supervision and guidance. The results and observations were checked and verified by me from time to time. The technique embodied in this work were undertaken by the candidate himself.

This work fulfills the basic ordinances governing the submission of thesis laid down by Bundelkhand University.

Dated : 25th Nov. 2003

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ACKNOWLEDGEMENT

Words fail me in this endevour of thanking all those luminaries who have lit the path of knowledge for me.

The guiding light during my research work has been ***Dr. R. Sinha M.S.,*** *Associate Professor, Deptt. of Surgery, MLB Medical College, Jhansi. I wish to grab this opportunity to express my sincere and heart felt gratitude for providing all the necessary facilities and for having spared his valuable time for this endevour. His intellectual fervour, clarity of thought and passion for perfection helped me to launch into a serious study of this topic. It was a honour to work under the master who guided, gave shape & supervised this work into its present form. I would forever be obliged for his timely suggestions, vigilant supervision and above all constant encouragement.*

Really thankful to the fatherly figure, ***Prof. R. P. Kala M.S.,*** *Head, Deptt. of Surgery, MLB Medical College, Jhansi for being my most valuable guardian cum teacher and helping me to evolve into a complete doctor.*

I am thankful to ***Dr. Dinesh Pratap M.S.,*** *Assitant Professor, Department of Surgery, M.L.B. Medical College, Jhansi, who taught us that excellence never gets over shadowed & who constantly inspired me to perfect the right skills. I am thankful for his valuable advice & unstinting help at every juncture.*

For their support & help, I am thankful to my colleagues, Juniors and my friends.

For flawless typing of this manuscript, I am indebted to Mr. Rakesh Maurya (New Janta Printers).

Above all I feel highly indebted to my parents for making every endevour possible by constantly supporting every little step I dared to take.

CONTENTS

Introduction

INTRODUCTION

We certainly stand on an important threshold as we move into the 21st century. It may be fortuitous that laparoscopy exploded onto the general surgical scene with such great force at the beginning of this decade. The tremendous commercial competition that it engendered has tapped the inventive genius of the medical-engineering world. Surgeons are finally getting some of the instrumentation and equipment that they sorely needed and had requested for, for years. Laparoscopy is not new; Palmer in the 1940s and Semm, Manhes, and Bruhat in the 1960s and 1970s deserve recognition and homage for the great centers of excellence that they developed during those years, in which 80% of the gynaecologic surgery was performed laparoscopically. Urologists, orthopedists, and thoracic surgeons did not completely abandon endoscopic surgery; yet these disciplines have not seen the explosion of inventive attention that abdominal surgery has generated. Some of this may be because of the broad nature of abdominal surgery but more likely, laparoscopy was an idea whose time had truly come technologically. With the world of fibreoptics, microelectronics, and computerization all coming of age during the past decade, the timing may have been perfect for a laparoscopic revolution. Certainly the rapidity with which all of these techniques have been so universally adopted could not have been predicted.

The next important area for development may be the human-computer interface systems, which will greatly expand the sense of being able to perform laparoscopic surgery with the same tactile sense as open surgery. This will take significant investment and research but would represent a meshing of technologic advances that has unlimited potential. At least for today's surgeon the sky is the limit for creative enterprise, so let us seize the moment and move our specialties forward in a way and on a scale that may not happen again for many generations.

Review of Literature

REVIEW OF LITERATURE

The first documented laparoscopic examination of the abdominal cavity was performed by Ott in 1901(1). The work of this Russian gynecologist predated the work of Kelling, who utilized a cystoscope to evaluate the abdominal cavity of dogs (2). During the early twentieth century the concept of pneumoperitoneum was developed, which lead to the work of Jacobaeus, who introduced the term "Laparoscopy"(3). In addition, Jacobaeus first described the diagnosis of cirrhosis, metastic tumours and tuberculous peritonitis using the laparoscopic. During the next two decades, laparoscope was introduced in the United States by Berheim(4). Later Ruddock advocated "peritoneoscopy" and demonstrated improvement in diagnostic accuracy(5). The further application of laparoscopic techniques to abdominal cancer was reported by Benedict, who discovered that gastric and colonic neoplasms together with gynecologic disease were causes of ascites(6). The safety of pneumoperitoneum was improved when Fervers advocated the use of oxygen or carbon dioxide rather than room air in 1930's (7). Greater safety in the installation of gas was achieved by Veress who developed a spring loaded needle that could safely be introduced into the peritoneal cavity in the late 1930(8).

In 1966, the Hopkins rod lens system was developed for rigid endoscopes that greatly improved image clarity and brightness. Kurt Semm, a German gynaecologist and engineer contributed to the development of an automatic insufflater that precisely controlled gas flow and monitored intra-abdominal pressure during laparoscopy(9). In early 1980's, a miniature television camera was developed that attached directly to the laparoscope. Coupled with high resolution video monitors, it provided a videoendoscopic view of the abdominal cavity. Subsequently, in 1987, Phillpe Mouret(10), in France, performed the first laparoscopic cholecystectomy in a human. The widespread acceptance of laparoscopic cholecystectomy by the public and the surgical community has expanded surgical laparoscopy into most areas of general surgery and other surgical disciplines.

Historical Milestones in Laparoscopic Surgery

Year	Investigator	Contribution
1901	Kelling	1st laparoscopic examination of the abdominal cavity
1911	Jacobaeus	1st laparoscopic examination in humans
1929	Kalk	Dual trocar technique
1938	Veress	Spring loaded obturator needle for pneumoperitoneum
1966	Hopkins	Development of rod lens optical system
1960's	Semm	Development of automatic CO2 insufflator and numerous laparoscopic instruments
Early 1980's	-	Development of miniature TV camera chips
1987	Mouret	1st laparoscopic cholecystectomy

Before 1987, the laparoscope was thought to be an instrument that allowed only for intra-abdominal inspection and biopsy of suspicious lesions. With renewed interest in laparoscopy and finding wider applications in the study of gastrointestinal malignancies, diagnostic laparoscopy is found to be a useful tool in the diagnosis and staging of these neoplasms. With the introduction of the laparoscopic technique in cholecystectomy, many other abdominal procedures have been tried with the laparoscopic technique with varying degrees of success.

The laparoscopic technique has opened up a new possibility of a minimally invasive approach to rectopexy. With the elimination of a major incision in laparoscopic rectopexy, the patients may benefit from less morbidity associated with a major abdominal wound.

The role of laparoscopy in the case of patients with intestinal malignancies in currently evolving. It is imperative that using laparoscopy in the case of patients with intestinal malignancies in carefully and thoroughly evaluated since this

technique can either benefit or adversely affect survival or quality of life. Laparoscopy has a role in the surgical treatment of a variety of malignancies, including gastric carcinoma, pancreatic cancer, splenic malignancies, adrenal cancers and colorectal cancers.

Minimally invasive colon resection was first reported in the literature in 1991. Currently, 5-10% of colon resections are done using the laparoscopic approach.

The role of laparoscopic resection of ileocaecal tuberculosis has been evaluated and is being performed successfully. Laparoscopic assisted hemicolectomy is being evaluated the world over for benign and malignant diseases.

Laparoscopic appendectomy presents a safe and effective alternative to open surgery. Advantages including a shortened hospital stay, reduced incidence of wound infection, and hastened convalescence.

Anecdotal reports of laparoscopic treatment of small bowel obstruction due to adhesions, tuberculosis and bands have suggested that this procedure can be safely performed and that it may result in earlier discharge than open procedures, particularly in the geriatric age group.

Current Status of Therapeutic Laparoscopic Intervention in Non-Acute Intestinal Pathologies

CURRENT STATUS OF THERAPEUTIC LAPAROSCOPIC INTERVENTION IN NON-ACUTE INTESTINAL PATHOLOGIES

POST-OPERATIVE ADHESIONS

. Estimates have indicated that up to 93% of patients who have undergone abdominal surgery develop adhesions (11). In most cases they do not have clinical consequences; however in thirty-five percent of these have to be readmitted at some time for problems resulting from adhesions (12).

Postoperative adhesions after abdominal surgery generally present in two forms : as frank episodes of occlusive crises of abdominal pain or as intercurrent episodes of chronic abdominal pain. Although it cannot be considered a clinical manifestation of adhesion syndrome, up to 20% of cases of infertility are reported to be the result of postoperative adhesions (13). Adhesions can present in various forms, ranging from single strips to multiple adhesions. They may develop between several intestinal loops, between intestinal loops and solid organs, or between the abdominal wall and the intestine. Postoperative adhesions account for 1% of all hospital admissions and 3.3% of all laparotomies (14).

In the early years of laparoscopy, prior abdominal surgery was thought to be an incontrovertible contraindication for laparoscopic abdominal surgery. These criteria have changed over time and it is now considered a relative contraindication only in certain cases. The advances in the technique are so significant that laparoscopy is even considered the approach of choice for adhesionolysis. In cases of elective surgery, the laparoscopic approach can be used successfully in up to 80% of patients, whereas in emergency surgery this decreases to 59%(15). The conversion rate to laparotomy in this type of surgery is between 5.4% and 16%, depending on the group (11,15). The conversion rates are higher in the case of emergency surgery versus elective surgery, being 36% and 7% respectively. At present laparoscopic adhesionolysis can be considered a safe, effective technique in patients who must undergo elective or emergency surgery for adhesion syndrome (11). It is suitable in surgery for any condition in which adhesionolysis is necessary to perform the specific procedure, in chronic abdominal pain directly related to the adhesions.

PREOPERATIVE ASSESSMENT OF ADHESIONS

Factors associated with the presence of adhesions

When considering laparoscopic adhesionolysis, it is difficult to determine how many adhesions may be present in the abdominal cavity before the actual operation. A medical history of on or more of the following is often associated with a large number of adhesions(13).

1- Process causing the previous surgery

Diffuse peritoneal abdominal processes

2- Type of Surgery

Significant dissection of tissues

Extensive manipulation of instestinal loops

Irrigation of cavity with irritating substances.

3- Type of previous incision

Midline infraumbilical laparotomy

4- Evolution of the previous surgery

Intra-abdominal complications

Intra-abdominal abscess

Intestinal fistula

Re-operation

Wall complications

Deep infection

Evisceration

Detection of adhesions during the preoperative period

Even though there is some possibility of predicting the presence and type of adhesions based on the factors described, it is quite difficult to identify the cases with the largest number of adhesions and, therefore, the ones involving the greatest difficulty for the surgeon.

Various imaging techniques (USG,MRI) have been studied in this context in an attempt to identify intra-abdominal adhesions prior to the surgery(16,17).

In fact, an attempt has been made to create an imaging map of the abdominal cavity before performing laparoscopic procedures in patients who have previously undergone open surgery, in order to detect adhesion-free areas and thereby minimize the risk of lesions with the Veress needle used to create the pneumoperitoneum or with the insertion of the initial trocar. In published studies sonography has shown a diagnostic accuracy of 88.5% with a specificity of 31.8% to 90% and a sensitivity of 90% to 100% in the detection of adhesions during the preoperative period in patients who will undergo laparoscopic surgery (16,17). Magnetic resonance (18) ha also been used to create a map of intraperitoneal adhesions during the preoperative period in patients scheduled for laparoscopic surgery, showing a sensitivity of 87.5% and a specificity of 92.5%.

Intraoperative complications of adhesionòlysis

1.Intestinal perforation

As is true with lesions of the main biliary tract during laparoscopic cholecystectomy, the importance of this complication lies in its intraoperative detection, due to the fatal consequences it may have in the postoperative period if it is missed, being necessarily a reoperation that involves a major risk of sepsis that may be life-threatening (21). All intestinal loops implicated in the adhesionolysis process must be meticulously examined before continuing the procedure.

If there is any suspicion of perforation, the indication is conversion to open surgery or performance of a minilaparotomy by lengthening one of the trocar holes to check the loop and then continue by laparoscopy.

Once the adhesionolysis is completed the loops that were adhered to the wall are carefully checked. If a tear of the serosa of the bowel is found, one must ensure that there are no leaks and assess the need for suturing. This can be done by laparoscopy. If a perforation is detected, its extension should be determined, since a puncture or small perforation can be sutured by laparoscopy. As described earlier, when the perforation is large, one usually performs a minilaparotomy at the site used for the largest trocar in order to repair the loop.

2.Bleeding(20)

This usually occurs after dissection of greater omentum adhesions and is stopped in most cases with simple electrocoagulation. Sometimes the use of clips or endoloops is also necessary. In the case of hepatic parenchyma bleeding due to rupture of Glisson's capsule, electrocoagulation should be attempted, as explained earlier. If bleeding continues, placement of an absorbable hemostatic material will generally control it.

Wall bleeding after completing adhesionolysis is usually stopped with simple electrocoagulation. Adequate hemostasis is extremely important since it helps to decrease the size of possible seromas and the creation of hematomas which, if they grow and create significant tension. S.Morales et al(19) usually perform coagulation of the wall of the entire area of adhesionolysis in order to coagulate small foci of bleeding and thereby, help to minimize the appearance of seromas.

3.Conversion(20)

Conversion is another of the complication of adhesionolysis. Open surgery may be required when there are numerous adhesions, when adhesions are so tightly attached to the abdominal wall that intense scar sectioning would make progress impossible or then the risk of injuring the intestinal loop is extremely high. On the other hand, conversion may be needed because of one of the complications described above, e.g., perforation or uncontrollable bleeding during the adhesionolysis process that requires repair by open surgery.

Postoperative complications of adhesionolysis

Intestinal perforation

This has been reported as one of the most serious complications of this type of surgery (21) and it should be taken into account although it is not unique to the laparoscopic approach since it has also been reported after open surgery (22). Patients who has undergone laparoscopic adhesionolysis develops fever and abdominal pain with signs of a peritonitis, missed perforation of the bowel should be immediately suspected. Early detection is key to preventing a life-threatening

septic condition. For this reason, if there is any suspicion of this condition of the patient should be operated on again by open surgery. In the event that the diagnosis is unclear because of the clinical and analytical condition of the patient or the imaging findings, laparoscopy should be performed followed by laparotomy if confirmed, since abundant irrigation and suction of the cavity plus resection of the effected segment will be necessary. Depending on the intra-abdominal situation, an ostomy or primary anastomosis should be performed and the prothesis should be removed, since it has been exposed to a septic environment.

Bleeding

Although it has been also described as a complication of adhesionolysis (23), bleeding is a rather infrequent fact after this type of surgery. However, it may require the performance of another laparoscopic, or open, procedure to suck blood from the cavity and to identify and inhibit the focus of bleeding.

Complications associated with adhesionolysis in one series

Complications associated with the presence of adhesions during other laparoscopic procedures (data from the C. Ballesta and I. Poves series)

The results of 225 patients operated on by laparoscopy between January 1992 and June 1997 who had previously undergone some kind of open surgery (28% supramesocolic and 72% inframesocolic) are presented. The surgeries carried out were 164 cholecystectomies, 45 anti-reflux procedures, 4 partial gastrectomies, 4 adhesionolysis procedures, 3 cholecystectomies with choledochotomy, 2 gastroenteroanastomoses, 2 left colectomies and 1 colectomy with polypectomy. A 0-degree telescope was used in all cases.

Although adhesionolysis as such was only carried out in four cases, all these surgeries were undertaken after performing extensive release of adhesions (to one degree or another), and the adhesions were one of the main reasons for conversion to laparotomy. The conversion rate to laparotomy in this series was 1.3%. Three patients were converted, one because it was impossible to continue due to dense adhesions and another two due to uncontrollable bleeding.

LAPAROSCOPIC COLECTOMY BENIGN AND MALIGNANT CONDITIONS

Following the success and excitement surrounding laparoscopic gallbladder surgery in the late 1980s, surgeons began applying this technology to the treatment of other organ systems, including the large intestine, Initial reports of laparoscopic and laparscopically assisted colon surgery for both benign and malignant disease first appeared in 1990. Laparoscopic colon resection has been successfully performed for the treatment of a wide spectrum of disease processes of the colon. The most common diagnosis for which laparoscopic assited bowel surgery was performed by Ambroze et al (80) is inflammatory bowel disease; however the most common indication for laparoscopic assisted left colectomy was diverticulitis.

Indications for Laparoscopy-assisted Bowel Procedures (80)

1. Carcinoma
2. Crohn's disease
3. Polyps/polyposis
4. Ulcerative colitis
5. Diverticulitis
6. Colonic inertia
7. Anal incontinence
8. Rectovaginal fistula
9. Rectal prolapse
10. Volvulus
11. Endometriosis
12. Arteriovenous malformation

Laparoscopy has a significant role in bowel surgery, as is evident by the number and variety of procedures performed in colorectal practice.

Procedure

1. Right colectomy
2. Left / sigmoid colectomy
3. Proctocolectomy / J-pouch
4. Total / subtotal colectomy
5. Stoma / bypass
6. Ileocolic resection
7. Low anterior resection
8. Abdominoperineal resection
9. Small bowel resection
10. Lysis of adhesions
11. Colotomy
12. Colostomy takedown

Because colon cancer is one of the most common malignancies in the United States, early success with laparoscopic resection of benign disease sparked interest in the curative and palliative treatment of this malignancy using these new techniques. Early studies (25) echoed the benefits of the laparoscopic techniques, citing a safe and effective procedure, improved postoperative pain management, faster postoperative recovery, and shorter hospital-lengths of stay. However, more recent reports(28) have dampened this initial enthusiasm by identifying an alarming rate of trocar site and wound recurrences of malignancies with the laparoscopic procedure. This controversy has led to a universal reevaluation of laparoscopic procedures in the treatment of all malignancies, including colon carcinoma.

Preoperative evaluation and preparation

Colon resections are among the most technically challenging laparoscopic procedures being performed. These techniques encompass a wide variety of procedures and approaches for lesions located from the caecum to the anal canal.

Each patient must have their operation tailored to the specific circumstances surrounding their disease process. A dedicated team of physician, nurses, and technicians working in concert preoperatively, intraoperatively and postoperatively is necessary for a successful outcome. A steep learning curve for mastering these techniques exists because of the complexity of skills needed for these operations. These hurdles are not insurmountable and can be built on basic skills already familiar to the laparoscopic surgeon. An important part of the developing a safe and successful laparoscopic program is skill assessments with graded complexity scales(24).

The development of appropriate techniques for laparoscopic and laparoscopically assisted colon resection of malignant disease requires that accepted principles of conventional colon resection be followed(25). These include avoidance of tumour-spill, obtaining adequate resection margins and harvesting adequate lymph node basins. Intraoperative staging with evaluation of the liver, omentum, peritoneum and remaining colon for synchronous lesions can be accomplished using both laparoscopic evaluation and intraoperative ultrasonography. Lesions selected for laparoscopically assisted resection have included T1 to T3 lesions, but typically not T4 lesions(26). Patients with evidence of metastatic disease may be candidates to undergo palliative laparoscopic procedures and enjoy the same short-term benefits of this procedure. Laparoscopic surgery also can be used for segmental or sleeve resections of large or broad-based polyps that are not amenable to colonoscopic removal(25). Resection of rectal lesions within 15cm of the anal verge can be extremely challenging using a laparoscopically assisted approach and should be reserved for experienced laparoscopic surgeons(26).

Tumor localization is critical in laparoscopic colon surgery. The loss of the tactile of sensation with laparoscopic surgery stresses the importance of other localization techniques. Lesions can be evaluated by barium enemas are not always a part of the routine pre-operative workup for colon cancer. However, they do help to localize the lesion more precisely, particularly if colonoscopic measurements are inaccurate. In addition, computed tomography scan may provide some anatomic information of the primary lesion and is helpful in evaluating the remainder of the abdomen for evidence of metastatic disease.

Colon pathology is being discovered at earlier stages with routine surveillance protocols. Improved methods for identifying these smaller lesions become crucial for both open and laparascopically assisted surgery. These lesions often may not be visible or easily palpable from the serosal surface of the bowel at the time of surgery. In addition, palpation of the colon during laparoscopy is limited by the lack of sensory feedback from the laparoscopic instrumentation. Lesions may be marked with colored dye or India ink during colonscopy that is then visible transmurally during surgery(26). Also radiopaque markers may be used that would be localized intraoperatively with fluoroscopy. Finally, intraoperative coloncopy may be necessary to confirm the location of the lesion.

RESULTS AND POSTOPERATIVE CARE

Following laparoscopic colon surgery, patients experience earlier return of gastrointestinal function and require a shorter hospital stay. On average, patients are able to tolerate an oral diet by the first postoperative day and length of hospitalization decreases from 10 days with open surgery to 3 to 5 days following laparoscopic colon surgery(27). Patients undergoing laparoscopic resections also have less perceived pain and lower narcotic requirements as compared with patients undergoing open surgery. Patients undergoing laparoscopic surgery have equivalent results as compared with open surgery regarding overall survival, length of specimens resected, adequacy of margins, and numbers of lymph nodes collected. Improved postoperative T cell-mediated immunity, lymphocyte function, and neutrophil chemotaxis are seen with laparoscopic surgery(27).

In one series, Richard D.Ing et al have reviewed 280 consecutive laparoscopically assisted colon and rectal resections for carcinoma performed since 1990. These data summarize the work of four surgeons who have compiled information from six institutions in the Miami area. The average follow-up of patients from this study was 2.9 years, with an overall survival rate for this group of 67%. Thirty-eight patients had stage 0 disease, 41 patients I, 99 patients stage II, 65 patients stage III, and 37 patients stage IV . The average length of stay for all patients was 6.2+ 5.3 days. The average ASA was 2.2+0.8. The average procedure time was 137.8+56.5 minutes. For all patients, our conversion rate was 12% , with a major complication rate of 15.3% and a minor complication rate of

11.3% . There were two trocar site recurrences (0.71%) and two wound/ extraction site recurrences, for a combined trocar and would recurrence rate of 1.4%. The trocar site recurrences were not at a site where the lesion was removed. The other two wound recurrences occurred at the site of tumor extraction prior to protection of the wound with an impermeable barrier. Since that time, there have been no wound or trocar site recurrences in any patients since 1993.

COMPLICATIONS

Several series of laparoscopic colectomy surgery have been reported in the literature. Laparoscopic surgery is associated with a significant decrease in both major and minor postoperative complications postoperatively. Laparoscopic surgery has a much smaller intraoperative blood loss. Operative times are longer initially because of the steep learning curve, but as the surgeon's experience with laparoscopy grows, operative times decrease significantly. Operative times ranging from 45 to 90 minutes is not uncommon.

PORT SITE RECURRENCES

An area of tremendous controversy concerns tumor recurrences at trocar sites used during the initial tumor resection. Initial reports of trocar site recurrences were isolated to case reports of biliary tract and ovarian tumors removed laparoscopically. Since then, several other reports have described recurrences of gastric cancer as well as colon cancer at instrument trocar sites(39). These port site recurrences have not been limited to regions where the tumor was removed from the peritoneal cavity. Recurrences include lateral trocar positions where no instrumentation had come in direct contact with the tumor or was the site of tumor extraction(28). They have occurred in both early and advanced stage tumors and following both potentially curable and palliative resections(27). These initial results did not appear to reflect the experience seen with conventional surgery.

There are several factors that may be related to these recurrences. These include increased local tissue trauma, augmentation of tumor nutritional supply by local hyperemia, and alterations in immunomodulation with the release of tumor

growth factors. In addition, the pneumoperitoneum created by insufflating carbon dioxide may create an optimal pH environment that assists tumorcell implantation. Possible mechanisms(28,29) for trocar site recurrences include spread of tumor cells by direct contact, exfoliation of cells by laparoscopic manipulation, spread of air-borne tumor cells by the circulating pneumoperitoneum, or spread of malignant cells intraluminally or by transvenous circulation. Direct spread of cancer cells by contact with wound edges does not explain recurrences at lateral trocar sites. Pneumoperitoneum has been shown to increase port site recurrences in an animal model, but human data are inconclusive. Shedding of tumor cells and local tissue traumatization during laparoscopic procedures may be a possible explanation, but this does not completely explain the patterns of recurrences(29). Similarly, intraluminal or hematogenous spread does not correlate with trocar site recurrences.

Animal studies offer conflicting data on wound recurrence as related to pneumoperitoneum. It is difficult to draw conclusions from isolated case reports of trocar site implants with initial surveys as high as 4% to 20%. Since their initial descriptions, several retrospective series have reported varying prevalences from single and multiple institutions, ranging from none to as high as 1.6%(28). If the recurrence rates of conventional surgery are more carefully examined, interesting patterns emerge. The incisional wound is the site of tumor regrowth in 1% of recurrences seen with open colon cancer resections(28). More recently, several large prospective studies have compared laparoscopic colon surgery for cancer with conventional surgery. These studies show equivalent pathologic data for specimens retrieved, with definite clinical benefits seen with the laparoscopic procedure, including improved pain relief, shorter lengths of stay, less blood loss, fewer complications, and quicker return of bowel function and return to normal activities. Because laparoscopic colon surgery is a relatively recent advancement, follow-up from these studies has been limited, ranging from several years to as long as 5 years. Nevertheless, overall cervical, local recurrence, and death rates appear to be similar. Specifically, an increased trocar site recurrence rate was not observed for patients undergoing laparoscopic colon resections (0.5%-1.7%)(28). Moreover, these rates appear equivalent to local cancer.

LAPAROSCOPIC SURGERY FOR RECTAL PROLAPSE

History

Prolapse of the rectum, or procidentia, denotes a full-thickness eversion of the rectal wall through the anal canal. Thus uncommon clinical entity has plagued mankind and challenged physicians since ancient times. The earliest clinical case of rectal prolapse was identified in a male mummy from Antinoe, Egypt (400 to 500 BC). A Biblical description of a disease that caused "bowels (to) fall out by reason of the sickness day by day" is testimony to the ancient history of this affliction. As surgeons' understanding of pelvic floor, colorectal, and anal anatomy improved, so did the operative procedures devised to treat rectal prolapse. Current surgical therapies employed to treat rectal prolapse are based largely on causes originally postulated by surgeons during the Renaissance period and 18^{th} century.

Patients who must undergo transabdominal operations for the treatment of rectal prolapse are ideal candidates for the application of laparoscopic surgery(30). Elderly patients who previously were deemed unfit for abdominal surgery may be candidates for laparoscopic abdominal procedures such as rectopexy and anterior resection.

Rectal prolapse has been successfully treated by means of a laparoscope by rectopexy, anterior resection with and without fixation, abdominal perineal resection, and perineal rectosigmoidectomy. The operations remain conceptually the same, but the technical aspects have changed.

Rectopexy is the most frequently performed laparoscopic operation for the control of rectal prolapse. All the steps of the equivalent open operation ie mobilization of the rectum to the pelvic floor with preservation of the presacral nerve, division of the lateral sacral ligaments and posterior rectopexy, can satisfactorily be accomplished laparoscopically.

A number of series and case reports (table 43) have described techniques using mesh and sutures. The length of the procedure seems to be related to a surgeon's experience. Intraoperative complications have been limited to minor bleeding, which can be easily addressed by converting to an open procedure if necessary.

Results after Laparoscopic Rectopexy

Study	No. of Patient	Follow-up (mo)	Mortality	Complications	Recurrences
1. Henry, 1994	5	2-10(6)	0	Incarcerated Hernia in port site	0
2. Solomon, 1996	21	1	0	1 converted to Open; 1 port site hernia	0
3. Cuscheri, 1994	6	4-27	0	Constipation(2)	0
4. Herold, 1994	19	6-18	0	Bleeding (1)	0

Longer operative times may increase potential risks. Intraoperative complications have been limited to minor bleeding, which can be easily addressed by converting to an open procedure if necessary. The incidence of deep venous thrombosis may increase especially in patients in a Llyod-Davies position with flexed legs(32). The position of the patients during surgery, the high intraabdominal pressure and the length of the procedure may all contribute to the development of this complication. The Llyod-Davies position, although helpful, is not strictly necessary for laparoscopic rectopexy and patients are now placed supine for pelvic laparoscopic procedures that do not involve endoanal manipulation. There are no published data on the incidence of post operative DVT in patients undergoing laparoscopic colorectal surgery.

Functional results are encouraging, with restoration of continence observed in 4 of 5 patients in one series (Graf et al, 1995). The virtual absence of postoperative abdominal pain and ileus has accelerated recovery time and mobilization. The length of the hospital stay usually is 4 to 6 days.

The laparoscopic rectopexy is therefore a safe and effective option for the treatment of rectal prolapse. It is less invasive than an open rectopexy procedure with decreased post operative disability.

LAPAROSCOPIC APPENDECTOMY

Since Kurt Semm reported the first laparoscopic appendectomy in 1983, the procedure has increasingly been utilized, and now prospective evaluations have been completed. Even though laparoscopic treatment for appendicitis has been documented to be a feasible and safe alternative to conventional methods and has enjoyed relative success to date, there remains skepticism in the surgical community with respect to its widespread implementation.

Surgical Complications and Postoperative Care

Complications are inherent to all surgical procedures, and laparoscopic appendectomy shares with open appendectomy the complications of wound infection, abscess or fistula formation, appendiceal stump necrosis, and small bowel obstruction. In addition, laparoscopic appendectomy carries the potential risk of Veress needle or trocar injury, depression of cardiac preload or exacerbation of obstructive airway disease secondary to pneumoperitoneum, and trocar-site Richter's hernia. To decrease the likelihood of these events, placement of all trocars under direct visualization, careful patient selection, and suture closure of all trocar defects larger than 5 mm are recommended.

Results of Laparoscopic Appendectomy

Data available from several prospective randomized trials are summarized in Table 37-1. Based on current prospective trials, several general conclusions have been drawn by experienced laparoscopic surgeons.

1. Indications for laparoscopic appendectomy should be the same as those for open appendectomy, and diagnostic laparoscopy dramatically improves the accuracy of the operative diagnosis.
2. Laparoscopic appendectomy can be safely performed in both children and adults with minimal increases in operative time, compared to open appendectomy. Perforation or abscess formation is not a strict contraindication to the laparoscopic approach, but successful endoscopic management will depend on the experience of the operating surgeon. The safety of laparoscopic appendectomy in pregnancy is yet to be demonstrated in a prospective study.

3. Wound infections are reduced with laparoscopic appendectomy and are dramatically lower when the appendix is removed via a specimen bag.
4. Hospital stays are similar for laparoscopic and open appendectomy patients, but adult patients have less pain and return to normal activities more rapidly following laparoscopic appendectomy.

Conclusion

Laparoscopic appendectomy presents a safe and effective alternative to open surgery when utilized in a competent manner, if established surgical principles are maintained. Advantages including a shortened hospital stay, reduced incidence of wound infection, and hastened convalescence justify a moderately increased operating room expense secondary to advanced instrumentation.

Contraindications to laparoscopic surgery:

Absolute :

1. Uncorrectable coagulopathy.
2. "Frozen" abdomen from adhesions.
3. Intestinal obstruction with massive abdominal distension.
4. Haemorrhagic shock.
5. Severe cardiac dysfunction.
6. Concomitant disease requiring laparotomy.

Relative :

1. Inability to tolerate general anesthesia.
2. Abdominal sepsis/peritonitis.
3. Intra-abdominal malignancy (excluding colon carcinoma).
4. Pregnancy
5. Morbid obesity
6. Multiple previous abdominal operations.

7. Severe chronic obstructive pulmonary disease.
8. Diaphragmatic hernia.

Abdominal sepsis with generalized peritonitis is usually an indication for open laparotomy, 'although patients with peritonitis from perforated ulcer(37) and perforated appendicitis(38) have been managed successfully.

Pregnancy once was considered as absolute contraindication to laparoscopy because of the unknown effects of CO2 pneumoperitoneum on the foetus. However several reports have demonstrated successful laparoscopic cholycystectomy in patients with severe biliary symptoms during the second trimester of pregnancy, without untoward effects in either the fetus or mother(40).

The management of patients with severe COPD remains problematic. In some case, it may be possible to carry out the procedure under regional or local anaesthesia. However the increased diaphragmatic pressure and CO2 absorption from the pneumoperitoneum and intravenous sedation required may further compromise the pulmonary condition of the patient. However, the advantage of a minimally invasive approach in such patients is that there is less impairment of post-operative pulmonary function than there is with conventional open surgery.

Monitoring during laparoscopy should include electrocardiographic monitoring, end tidal CO2 monitoring, blood pressure evaluation using either a cuff or an indwelling arterial line, and a bladder catheter that follows the urine output to be evaluated and decompression of the bladder for trocar insertion. A nasogastric tube should routinely be passed, in order to facilitate gastric emptying during the procedure.

Laparoscopic complications

Insertion Related :

1. Major vascular injury
2. Gastrointestinal injury
3. Bladder injury
4. CO2 embolism
5. Abdominal wall haemorrhage

Post-insertional Complications :

1. Gastrointestinal perforation (acute or delayed)
2. Laceration/bleeding from solid organs (liver, spleen, kidney)
3. Hernias of abdominal wall

Pneumoperitoneum Related :

1. CO2 embolism
2. Hypercarbia
3. Respiratory acidosis
4. Subcutaneous emphysema
5. Pneumothorax

7.Pneumomediastinum

Material & Methods

MATERIAL & METHODS

The study was conducted on patients presenting with signs and symptoms suggestive of any non-acute intestinal pathology in the out-patient department of MLB Medical College, Jhansi in the Department of Surgery over the past one year.

The conditions included among the heading of Non-acute Intestinal Pathologies were –

1. Sub-acute intestinal obstruction due to bands, strictures or adhesions (TB)
2. Recurrent appendicitis
3. Rectal prolapse
4. Carcinoma colon involving either ascending, transverse or descending colon or sigmoid colon
5. Appendicular lump.
6. Ileo-caecal tubeculosis.

Detailed history was taken, symptomatology assessed, signs were elicited and a probable pre-operative diagnosis was made. The pre-operative diagnosis was fortified with appropriate laboratory and radiographic investigations.

Apart from specific investigations, routine investigational work-up was done which included :-

a. Evaluation of other medical problems – Blood sugar
b. Evaluation of cardiac and respiratory systems – ECG and Chest X-ray if needed.
c. Normalization of fluids and electrolytes.
d. Antibiotics.
e. Evaluation of the genitourinary system – Urine routine & microscopic, blood urea, serum creatinine.
f. Appropriate laboratory and radiographic studies, Complete hemogram (Hb, TLC, DLC, ESR)

X-ray abdomen erect view with both domes of diaphragm.

USG whole abdomen.

Barium meal follow through & Barium enema.

Later the patient included in the study were divided into 2 categories :-

I – Those undergoing therapeutic laparoscopic intervention.

II – Those subjected to open surgical procedures.

AIM OF STUDY

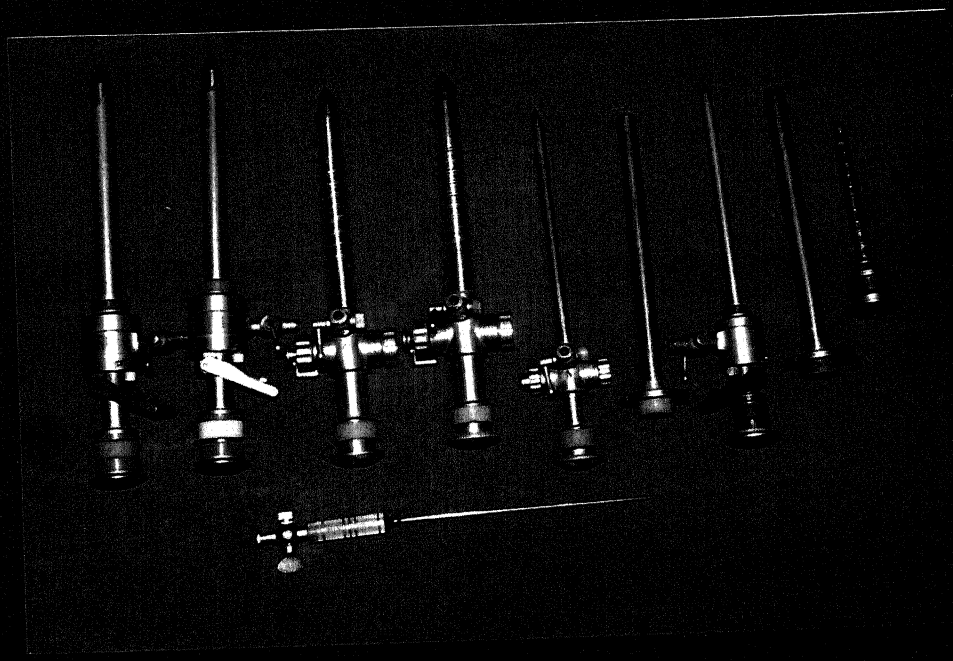
The basic aim of the conducted study over the last year was to compare and analyse the results of patients under group I with those of group II in terms of:-

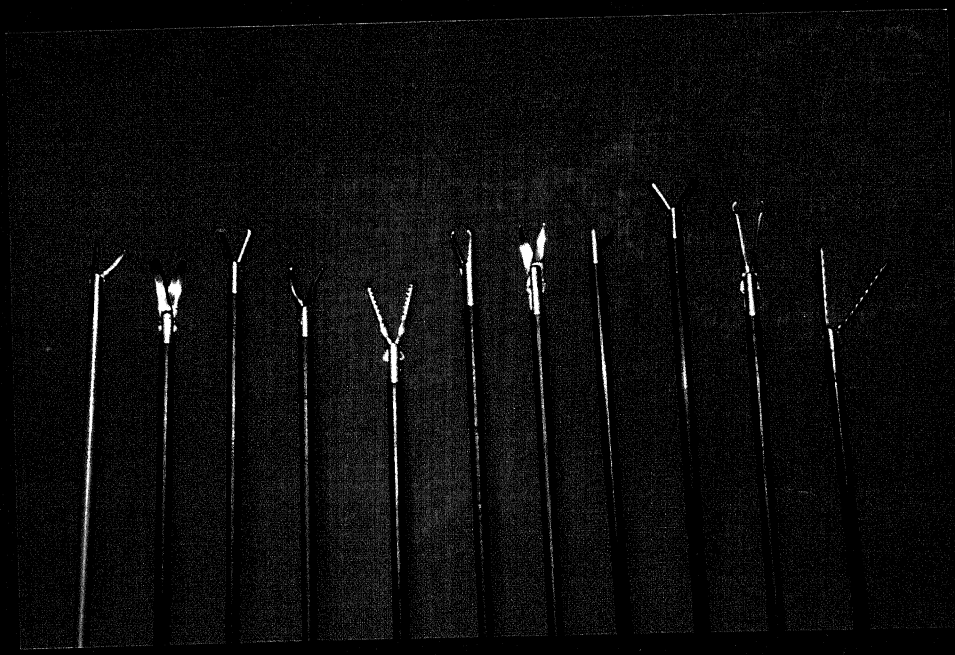
a. Feasibility
b. Alternative feasibility of assisted laparoscopic intervention
c. Operative time
d. Post operative pain relief
e. Discharge time
f. Return to work time.
g. Complications

INSTRUMENTATION

Instruments used :-

1. Insufflations and Optical Instruments :
   (a) Veress Needle : Used for initial creation of the pneumoperitoneum.
   (b) Trocars & Cannula : 5-6 mm (small) or 10-12 mm (large).
   (c) Laparoscopes : 10mm and 5 mm diameter – 30° view.





(d) Video system : It comprises of

(i) Camera : Attaches over the laparoscope eye piece, single or triple CCD chip > 500 cms.

(ii) Light Source : High intensity cold light source such as xenon or a halide.

(iii) Light cable : Consists of fine optical fibres or jel which carry light from source to laparoscope.

(iv) Television Monitors : High resolution monitor usually 600 times of horizontal resolution, should be compatible with the camera.

(e) Insufflator : The insufflator is a machine which pumps the gas into the peritoneal cavity for insufflation. For laparoscopic surgery the intraperitoneal pressure should be between 10-14 mm Hg which represents a volume of 2.5-4 litre in the relaxed peritoneal cavity.

2. Hand Instruments :

(a) Coagulating and Cutting Instruments :

(i) Diathermy hook (with or without irrigation port) : This hook and allows tissues to be hooked and lifted away from the surrounding tissue before being cauterized.

(ii) Diathermy spatula.

(iii) Diathermy bulb/bottom probe : for deep contact or spray coagulation.

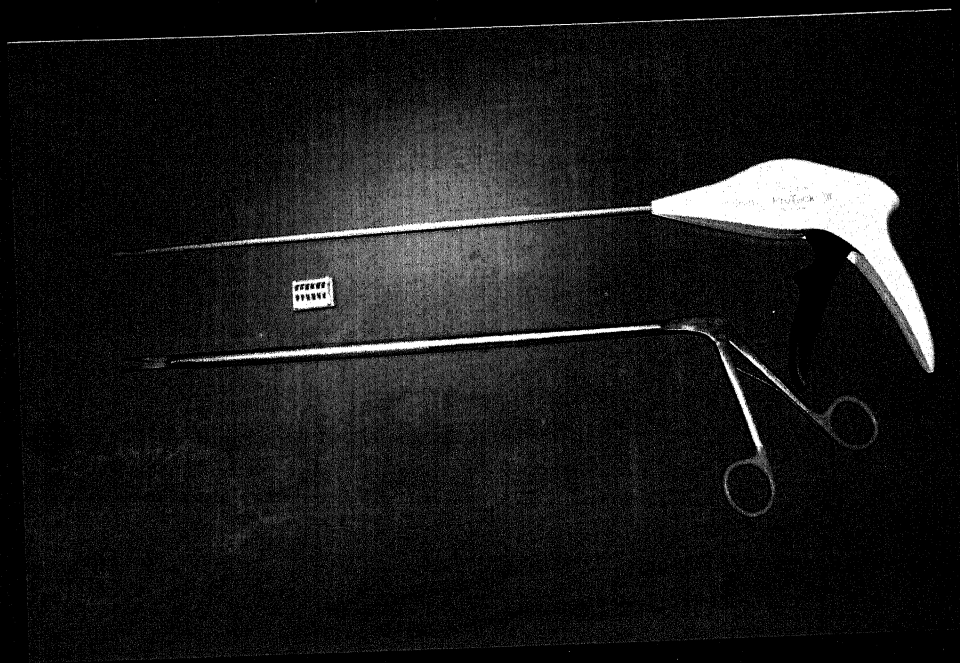
(b) Scissors : Scissors are used for precise cuttings.

(i) Metzanbaum

(ii) Hooked scissors

(iii) Plain scissors

(iv) Micro scissors



(c) Holding/grasping forceps

(d) Needle holders

(e) Dissecting instrument : As petilin forceps are the modifications of holding grasping forceps.

(f) Suction/irrigation devices : irrigation fluid is heparinized solution.

(g) Clips and clip applicators : Clips are small (3 mm), medium large (4-5mm), large (6-7 mm), extra large (9-10 mm). Clip applicators are usually 10 mm in diameter.

3. Sterilization of the Instruments :

Before use, the instruments are washed in soap and water and then the fibre-optic light cables and instruments are soaked in an antiseptic solution such as 2% aqueous glutaraldehyde (cidex).

After sterilization all instruments should be washed with sterile saline, as the sterilizing solution is irritant to the peritoneal cavity.

Anaesthesia – General

Statistical Analysis :-

After observation and results were derived from the study conducted during last one year, the results were subjected to proper statistical analysis thereby drawing conclusions from the study.

LAPAROSCOPIC ADHESIOLYSIS

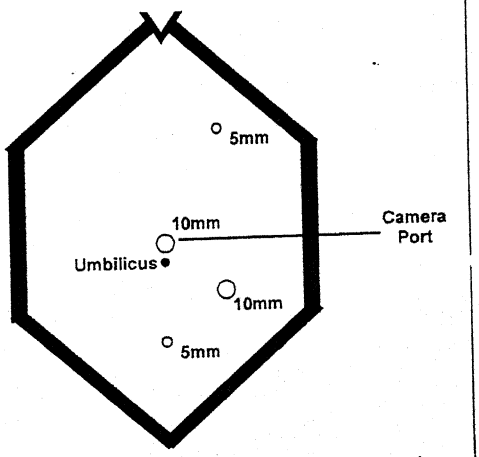
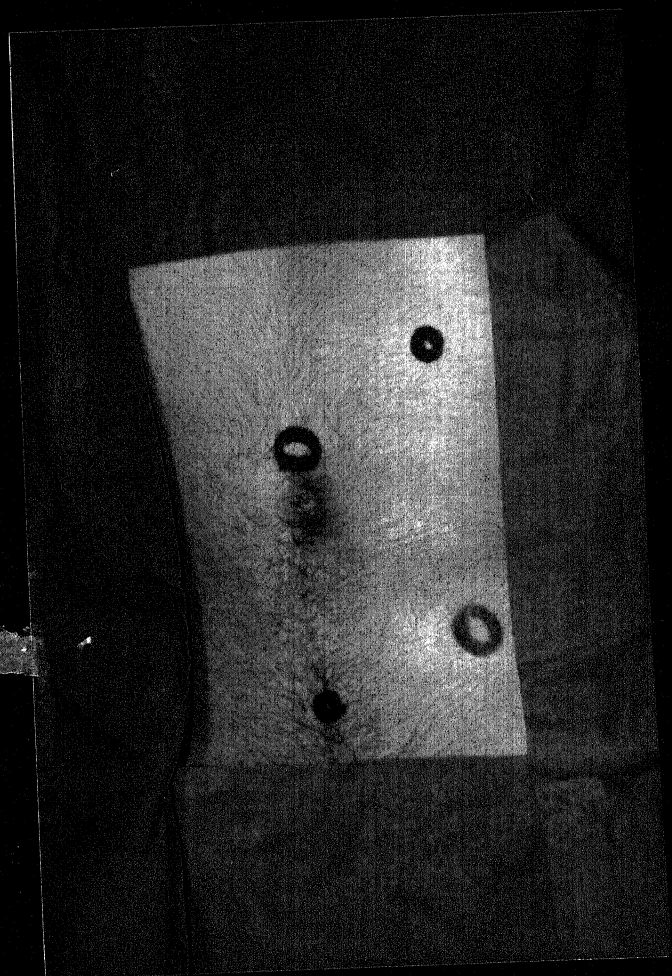


Diagram showing tthe placement of trocars and their sizes in case of Sub Acute Intestinal Obstruction (due to adhesions, bands)



OPERATIVE TECHNIQUES IN VARIOUS LAPAROSCOPIC PROCEDURES

1. Management of Adhesions

Creation of pneumoperitoneum and introduction of trocar

Patient is positioned supine on the table.

The Veress needle is used to create the pneumoperitoneum in all cases. The V-needle is usually inserted in the left hypochondrium since this is the area of the abdomen where one is likely to find fewer adhesions because of the lower frequency of inflammatory processes at this level(19). Alternatively open method of introduction of Hasson's Trocar is carried out.

Perforations are often associated with blind insertion of the initial trocar rather than with the Veress needle itself.

Once the trocar and the scope are inserted, in the left hypochondrium attempt is made to perform blunt dissection with the tip of the laparoscope if parietal adhesions are seen. If this was not possible, then introduction of a finger in the hole in order to separate adhesions from this area was carried out followed by laparoscopic dissection.

Later a 10 mm port was inserted in the left iliac fossa and a 5 mm third port (either suprapubic or left hypochondrium) was placed. Through them atraumatic bowel graspers were put into abdomen for adhesiolysis. Harmonic scalpel was used for sharp dissection of the dense adhesions. Finally the hemostasis was secured with its help.

All the ports were withdrawn and peritoneal cavity decompressed and trocars sites were stitched with chromic catgut.

2. OPERATIVE TECHNIQUE FOR LAPAROSCOPIC RIGHT HEMICOLECTOMY

Patient is placed supine in position, pneumoperitoneum is created using a standard technique for insufflation with a Veress needle and maintained at 12-15 mm Hg by an automatic CO2 insufflator.

A 10mm 30° telescope is inserted through supraumbilical port.

Total 5 ports are used in the procedure.

Supraumbilical – 10mm port (as initial camera port)

LAPAROSCOPIC ASSISTED (R) HEMICOLECTOMY

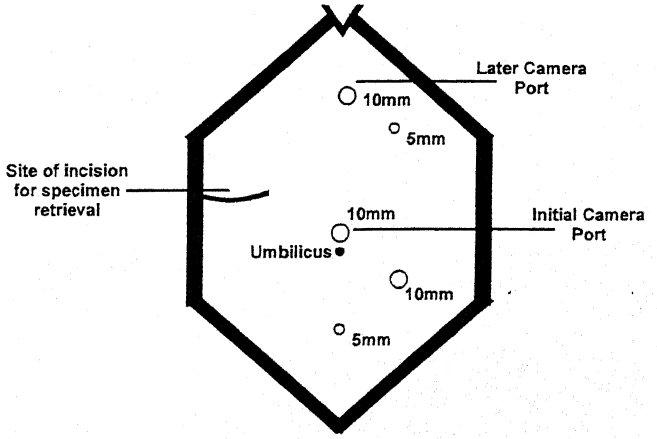
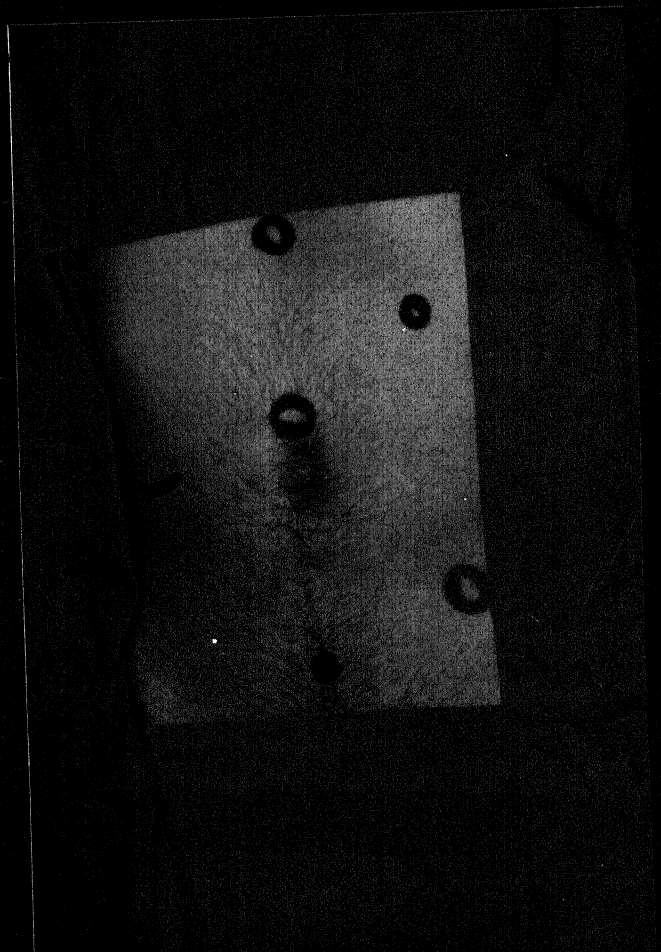


Diagram showing tthe placement of trocars and their sizes in case of right hemicolectomy for Ileocaecal tuberculosis



Left iliac fossa – 10 mm port

Suprapubic – 5 mm port

Left hypochondrium – 5 mm port

Epigastrium – 10 mm port (as later camera port)

Specific instruments used were – two Alligator bowel grasping instruments.

Harmonic scalpel was utilized for all the sharp dissection and maintaining hemostasis within the abdominal cavity.

The sequence of events in performing laparoscopic colon surgery is retraction of the bowel, mobilization, division of the mesenteric vessels, division of the bowel extracorporeally and extracorporeal anastomosis of the bowel ends.

Retraction of the right side of the colon is achieved by grasping the bowel with Alligator bowel grasping instruments.

Caecal mobilization is done with dissection of lateral peritoneal fold with the help of harmonic scalpel. Mobilization is performed along the right paracolic gutter by moving towards the hepatic flexure. Identification of vital structures such as ureter and duodenum is done.

After this, an 2-3"incision is placed transversely midway between right subcostal margin and anterior superior iliac spine. The mobilized caecum, ascending colon and hepatic flexure are delivered out. After ligation and division of mesentry, bowel is resected and extracorporeal anastomosis is done with Monocryl 3-0. After securing hemostasis, bowel is put back in abdomen and incision closed. After all the ports were withdrawn, peritoneal cavity was decompressed and the trocar sites were stitched with chromic catgut.

3. Operative Procedure in case of Laparoscopic Rectopexy

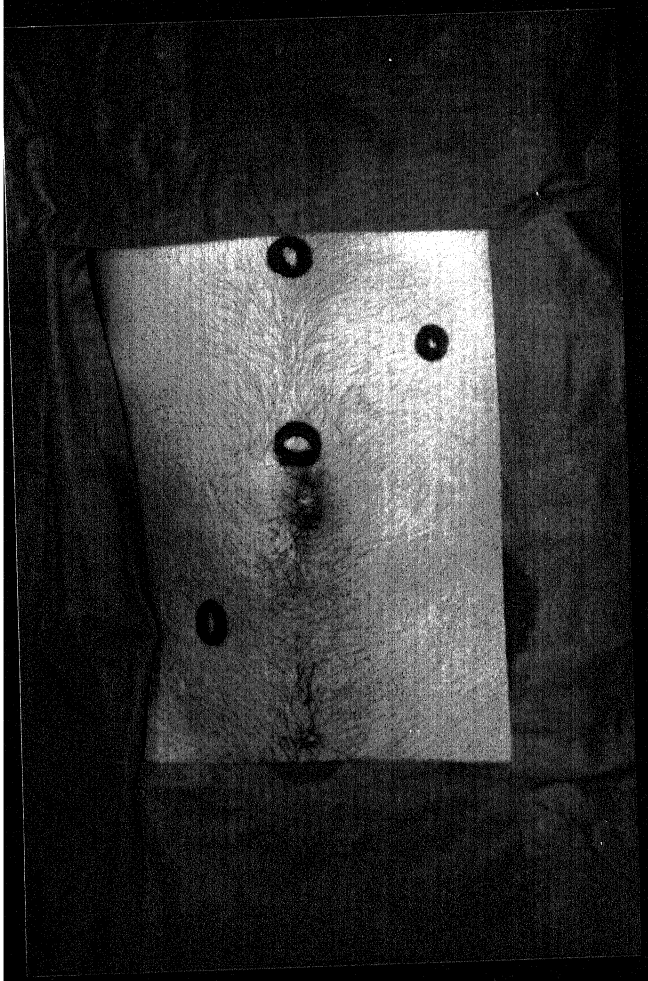
Patient is placed supine on the table with head-down tilt. A Urinary catheter is passed to deflate the bladder.

Pneumoperitoneum is created using a Veress needle with pressure maintained at 10-12 mm of Hg by an automatic CO2 insufflator.

4 ports are used –

10mm supraumbilical – for the camera

10mm in right iliac fossa



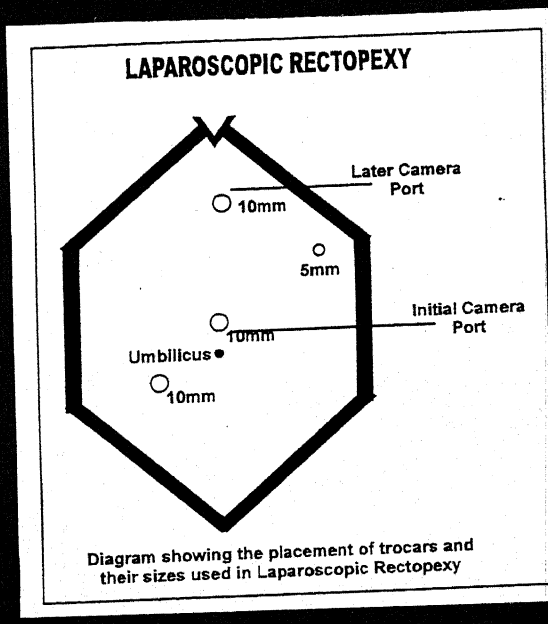
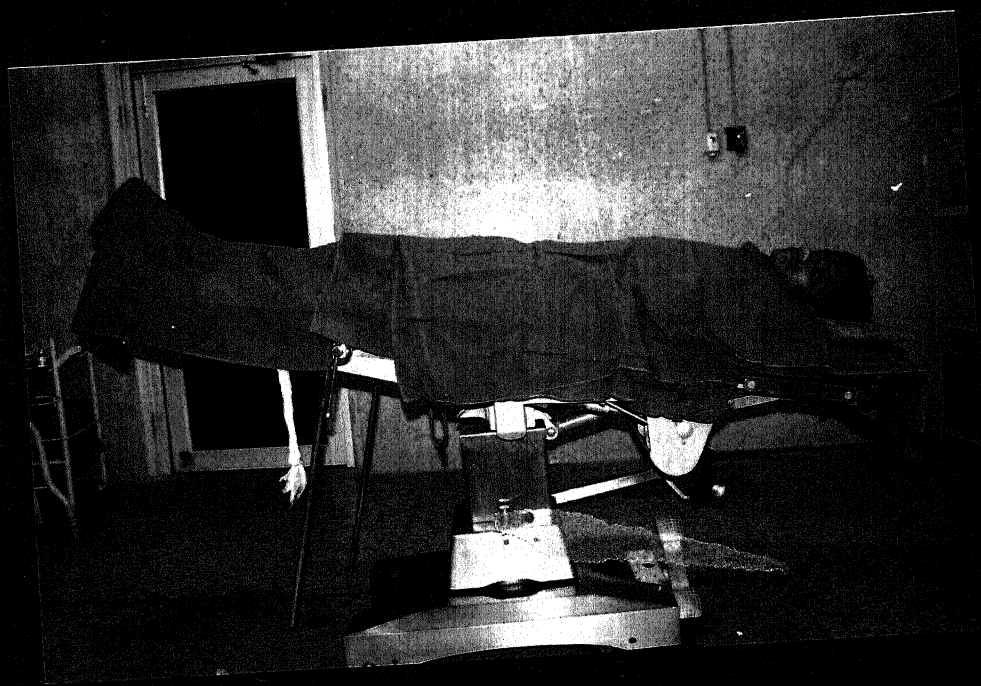


Diagram showing the placement of trocars and their sizes used in Laparoscopic Rectopexy



10mm in epigastium

5mm in left hypochondrium.

Initially the patient is placed in a steep Trendelenberg position allowing the small bowel loops to drop into peritoneal cavity.

A laparoscopic Babcock is passed through the right iliac fossa port to hold the rectosigmoid junction to the right and with the help of harmonic scalpel peritoneal reflection on the right side of the rectosigmoid junction is dissected. By careful dissection the avascular plane between fascial capsule of the rectum anteriorly and the fascia of Waldeyer posteriorly is dissected under direct vision.

The dissection was kept close to the rectum and posteriorly the roots, trunks and branches of the presacral nerve were identified and preserved. The left ureter was isolated as a precaution against inadvertent injury.

After mobilization of the rectum down to the pelvic floor, a strip of polypropylene mesh 6"x6" is introduced into the abdomen through RIF 10 mm port for placement in the presacral space.

The endoscopic stapler in then introduced through the umbilical port and the mesh is initially stapled to sacrococcygeal area. On average 3-4 staples are inserted cephaled to the initial staple to fix the mesh to the sacrum and presacral fascia. After fixation of the mesh, the rectum is held on light tension using the laparoscopic Babcock forceps and the right limb of the mesh is sutured / stapled to the serosa of the rectum.

The rectum is then retracted to the right, and the left limb of the mesh brought around the rectum and secured to the rectal wall in a similar fashion at the upper and lower mesh edges. Care is taken not to encircle the rectum more than 2/3 circumferentially.

The stapler is used to re-approximate the peritoneal edges before the operation is completed. The laparoscopic ports are then removed, followed by closure of the fascial defects with interrupted sutures.

LAPAROSCOPIC APPENDECTOMY

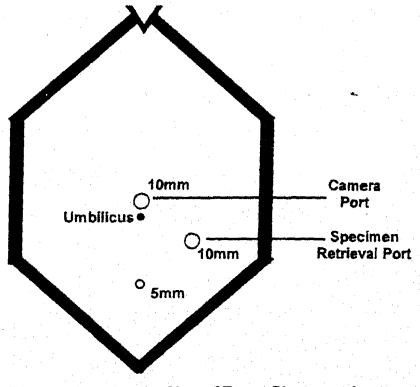
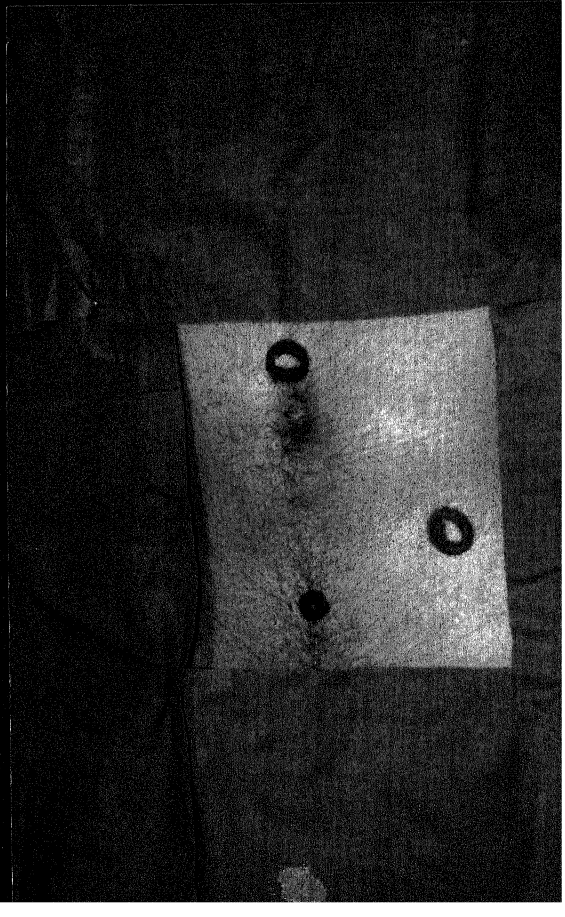


Diagram Showing the Sites of Trocar Placement & their sizes used in Laparoscopic Appendectomy



4. Operative Technique in Laparoscopic Appendectomy

Patient is placed supine on the table and an indwelling urinary catheter is placed into the urinary bladder.

Pneumoperitoneum is created using a Veress needle.

Later a 10 mm port is advanced into abdominal cavity through supraumbilical incision, through which 30° laparoscope is introduced.

A second 10 mm port is inserted in the left iliac fossa – through which an atraumatic grasping forceps is inserted to displace the omentum and the caecum and to expose the appendix.

Finally a third port is placed midway between umbilicus and pubic symphysis.

Any adhesions encountered around the appendix or caecum are divided with the help of harmonic scalpel.

Appendicular mesentry is also taken care of with the help of harmonic scalpel and then metal clips are applied at the base of appendix. Then appendix is cut with the help of scissors and the specimen is retrieved through 10mm port in left iliac fossa.

Hemostasis is secured in the abdominal cavity and then peritoneal cavity is decompressed. Port sites are closed with chromic catgut.

Observations & Results

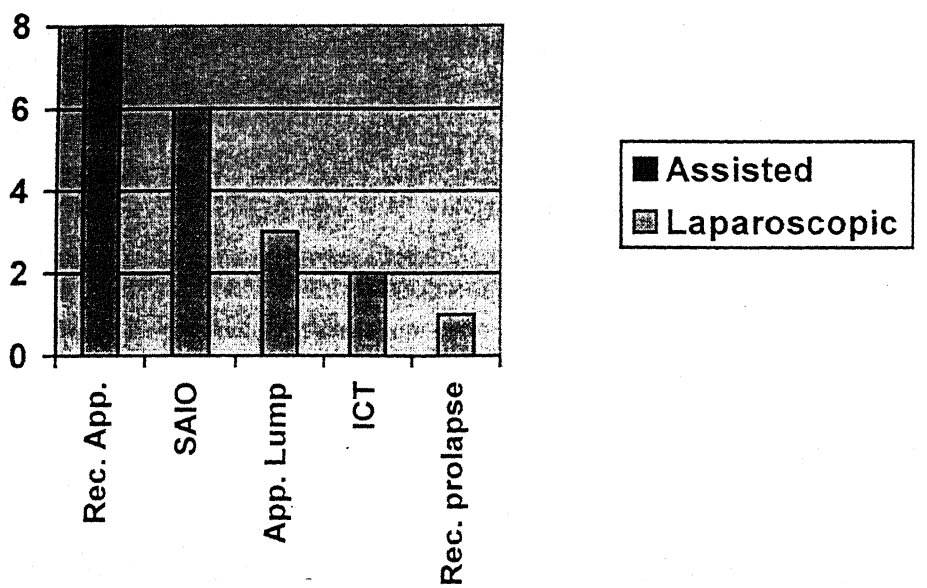
OBSERVATIONS & RESULTS

The present study has been undertaken at MLB Medical College, Jhansi over a period of 1year (from August 2002 to August 2003). During this period 20 cases of different non-acute intestinal pathologies were taken in the study.

Classification of Cases (n = 20).

Pathology	No. of Cases	%	Laparoscopy	Assisted	Converted
SAIO due to bands adhesions	6	30%	6	0	0
Rec. Appendicitis	8	40%	7	1	0
Appendicular lump	3	15%	2	1	0
ICT	2	10%	0	2	0
Rectal prolapse	1	5%	1	0	0
CA Colon	0	0	0	0	0

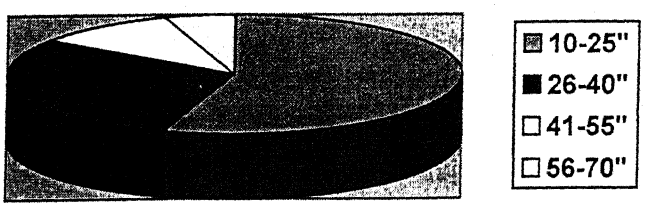
Among all the non-acute intestinal pathologies the commonest pathology was recurrent appendicitis (8 cases, 40%) followed by SAIO (6 cases, 30%)



Age Distribution

Range (in yrs)	No. of Cases	%
10 – 25	11	55%
26 – 40	6	30%
41 – 55	2	10%
56 – 70	1	5%

Most patients belonged to 10 – 25 years (55%)

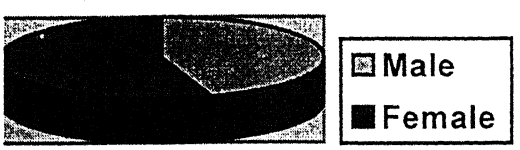


Sex Distribution

	No. of Cases	%
Male	9	45%
Female	11	55%

Among 20 pts included in study, males were 9 (45%) females 11 (55%)

M : F ratio is 0.81



Symptoms

The common presenting symptoms among the patients included in the study were as follows

Symptom	No. of Cases	%
Pain in abdomen	19	95%
Distension of abdomen	4	20%
Lump in abdomen	6	30%
Paucity of flatus	9	45%
'Gola' formation	2	10%
Vomiting / Nausea	10	50%
Altered bowel habits	-	-
Loss of appetite	2	10%
Weight Loss	5	25%
Bleeding / Discharge per rectum	1	5%
Something coming out per anus	1	5%

Commonest symptom was Pain in abdomen which was found in 19 pts. (95%) other commoner symptoms included Vomiting/Nausea (10 pts. 50%), Paucity of flatus – 9 pts (45%), Lump in Abdomen 6 pts (30%)

Avg. Duration of Hospital Study (in days) in different Laparoscopic Procedures

Sl. No.	Procedure	Duration (days)
1.	Lap. Appendectomy	2 days
2.	Lap. Adhesiolysis	4 days
3.	Lap. Rectopexy	5½ days
4.	Lap Assisted R Hemicolectomy	8 days

Mean Operative Time (in minutes) for different Laparoscopic Procedures

Sl. No.	Procedure	Lap.	Open
1.	Lap. Appendectomy	23 min	25 min
2.	Lap. Adhesiolysis	30 min	15 min
3.	Lap. Rectopexy	80 min	35-40 min
4.	Lap Assisted R Hemicolectomy	72 min	45 min

Approximate number of pain killer injections given in the post-operative period

Sl. No.	Procedure	No. of ampoules
1.	Lap. Appendectomy	~ 3 ampoules
2.	Lap. Adhesiolysis	~ 3 ampoules
3.	Lap. Rectopexy	5 ampoules
4.	Lap Assisted R Hemicolectomy	6.5 ampoules

Mode of specimen retrieval in different laparoscopic procedures performed-

1) Laparoscopic Appendectomy – through the left infraumbilical 10 mm port.
2) Laparoscopic Assisted Hemicolectomy through a transverse incision placed midway between right costal margin and anterior superior iliac spine

Discussion

DISCUSSION

The study included 20 patients of different Non-Acute Intestinal pathologies who were registered between August 2002 to August 2003 in the Department of Surgery, MLB Medical College, Jhansi.

The age of these 20 patients ranged from 13-60 years and most of the non-acute intestinal pathologies occurred in 10-25 years range (55%).

Of all the non-acute intestinal pathologies, include in the study, Recurrent Appendicitis was the commonest (40%), followed by SAIO (30%) due to bands and adhesions, Appendicular lump (15%), Ileocaecal tuberculosis (10%) and Rectal prolapse (5%).

All the cases were subjected to therapeutic laparoscopic interventions, with the aim to compare and analyse the results with other contemporary studies and to assess their outcome in terms of :-

1) Feasibility
2) Alternative feasibility of assisted laparoscopic intervention.
3) Operative time.
4) Length of hospital stay
5) Complications.

Laparoscopic Adhesiolysis for SAIO

Adhesions may be defined as abnormal attachments between tissues and organs. The development of acquired adhesions is a generalized phenomenon in response to trauma to the peritoneum, the surface of which is extremely delicate, as its cells are very loosely interconnected. The trauma may be inflammatory or surgical, and may include; exposure to infection or to intestinal contents ; ischemia ; irritation from foreign materials such as sutures, guage particles, or glove dusting powder. Adhesion formation generally requires coaption of two traumatised mesothelial surfaces, or of one surface and the omentum.

Intestinal obstruction is the most severe consequence of adhesions. 30-41% of patient who require abdominal reoperation have adhesion related intestinal obstruction.(74). For small bowel obstruction, the proportion rises to 65-75%(74).

Clinical consequences of adhesions are not confined to the gut, adhesions are a leading cause of secondary infertility in women 20% (76) and can cause substantial abdominal and pelvic pain. In addition to this morbidity and workload, post surgical adhesions waste surgical time and operating theatre resources and increase the difficulty and risk of surgical re-entry.

Laparoscopic adhesiolysis is the oldest laparoscopic procedure used in digestive surgery. It is a safe and effective management option for patients with prior abdominal surgery with chronic abdominal pain or recurrent bowel obstruction not attributed to other intra-abdominal pathology. Enthusiasm for elective adhesiolysis is often limited by the concern about subsequent scar tissue formation following major laparotomy. Many studies suggest a lower incidence of scar tissue formation following laparoscopic procedures. Therefore, it is possible that laparoscopic adhesiolysis would result in immediate resolution of symptoms attributed to intra-abdominal adhesions, with less likelihood of subsequent recurrence of adhesions and symptoms.

Emergency adhesiolysis is a difficult procedure, as shown by the high conversion rate in the literature (35.9%). The emergency context brings together several factors that are unfavourable for laparoscopy(74).

- A reduced work area because of the distension of the small bowel.
- An increased risk of perforation of the distended fragile bowel with the Veress needle or trocar, during the dissection, or even while manipulating the bowel loops.
- A greater risk of incomplete adhesiolysis.
- Difficulty in assessing the small bowel, especially its color.
- The risk of releasing bacteria while manipulating stagnant intestinal fluid, and
- The possibility of a prolonged procedure.

For these reasons, it is preferred to perform laparoscopy shortly after resolution of the acute obstruction. The same disorder can then be treated under much more favourable conditions, with an adequate work are a and a relatively normal (neither distended nor fragile) small bowel.

Generally, complications associated with the creation of a pneumoperitoneum and the insertion of the first trocar during laparoscopic surgery are infrequent, with a reported incidence ranging from 0.008% to 1.53% (77). The risk of visceral injury during these maneuvers is substaintially greater in patients who have previously undergone laparotomic surgery, owing to possible presence of abdominal wall adhesions. Visceral injury, more over, though less dramatic than vascular damage, is associated with late morbidity and mortality related to the fact that it is often identified only when clinically frank sepsis has become apparent.

To reduce the incidences of these complications, several authors (78, 79) have proposed procedures involving the performance of a minilaparotomy for the introduction of the first trocar and the creation of the pneumoperitoneum.

The location of the ports used in the laparoscopic adhesiolysis of small bowel is highly variable.

The inadvertent intestinal injury (missed enterotomy) is the Achilles heel of laparoscopic surgery of the small bowel(75).

In the present study, 6 patients presented with features suggestive of Sub Acute Intestinal Obstruction who were subjected to therapeutic laparoscopic intervention. Among 6 patients, only one had an omental band as the cause while rest five had adhesions of the small bowel.

For all the cases, patient was placed supine on the table in our study as in other studies by Schenk et al (11) and Ellis H et al (12). Three ports were used – first supraumbilical 10 mm port, second 10 mm in left iliac fossa and 3rd port 5mm in suprapubic midline.

Our study recorded the mean operative time (in minutes) for laparoscopic adhesiolysis as 23 min which was comparable to open approach – 25 minutes by the same surgical team. Studies by Schenk et al (11) and Ellis H et al (12) reported the mean operative time as 37 minutes and 42 minutes respectively.

Average duration of hospital stay was 4 days for laparoscopic adhesiolysis in our study as against 7 days in the study by Schenk et al (11). There were no significant complications in the intra operative or post operative period while Ellis et al reported 1 case of missed enterotomy out of 21 cases.

In conclusion, laparoscopic adhesiolysis for chronic abdominal pain, recurrent bowel obstruction, or both, is safe and effective and results in minimal peri-operative morbidity.

Laparoscopic Assisted Right Hemicolectomy

Laparoscopic surgery has had a major impact on colorectal surgery. Laparoscopic colorectal surgery is feasible, efficacious, safe and of benefit to the patient. In case of laparoscopically assisted procedures, most benefits of minimally invasive surgery are retained, and some of the disadavantages such as lengthy operating time and increased equipment costs are lessened. This technique in simpler and thus more readily accesible to a larger proportion of colorectal surgeons. In case of totally laparoscopic procedures, intracorporeal resection and anastomosis using presently available equipments is complex, lengthy and requires particular aptitude and training. Performing resection and anastomosis extracarporeally also minimizes the risk of peritoneal faecal contamination. **It is important to emphasise that conversion rate is not synonymous with failure ; rather it should be recognised as the application of a sound surgical judgement.**

The question is no longer about the feasibility but rather about the advisability of laparoscopic colectomy. Dire consequences may result from resection. Injuries to the small bowel and ureters exist (63). Anastomotic leak, post operative bowel obstruction and port site herniation have been noted (64, 65). Conversely, reports of port site implants after laparoscopic procedures in patients with intraabdominal malignancies are the source of increasing concern and the most important factor that precludes wide use of laparoscopy in the treatment of malignant diseases.

This phenomenon of port-site metastasis, in cases of laparoscopic procedures for colorectal cancers is particularly concerning for four reasons. First, not all recurrences have been at the port through which the specimen was retrieved. Second, the number of reported cases undoubtedly represents only the

'tip of the iceberg'. Third, the phenomenon is not exclusive to advanced lesions. Fourth, the problem does not seem to be unique to laparoscopic colectomy. Even diagnostic laparoscopy has been associated with port site metastasis in the literature. Cook and Detin found an 11% port site recurrence rate in a series of 46 patients who underwent laparoscopy for different malignancies (66).

Pathogenesis of port site metastasis can be explained in different ways. Development of port site metastasis requires the presence of viable cancer cells at the trocar site. This situation is very likely to occur when a malignant tumor is removed through a narrow incision of the abdominal wall. Such direct implantation of tumor cells has been confirmed by literature review (67). It has been suggested that growth of cancer cells at port sites is augmented by insufflating gas into peritoneal cavity because of turbulence. In an experimental study in rats using colon cancer suspensions, Bouvy et al (68) recorded the absence of tumor deposits at trocar sites when gasless laparoscopy was used while tumor growth was found at trocar sites after CO2 insufflation. Another hypothesis is that CO2 has a stimulating effect on tumor growth. Jacobi et al (69) assessed the invitro growth of colon adenocarcinoma exposing the tumor cells to either CO2 or helium. Tumor growth was significantly less when helium was insufflated. Another concern about gas insufflation during laparoscopy for cancer is leakage of gas through and around the trocars. This leakage might result in an accumulation of tumor cells at the trocar site which has been described as the 'Chimney-effect' by Kazemier et al (70).

Local application of cytotoxic or anti-adherence agents at trocar sites after a laparoscopic procedure is a possible way to prevent port-site metastasis. Jacobi et al (69) studied peritoneal tumor growth after application of either heparin, taurolidine or a combination of the two. Tumor growth was least when a combination of heparin with taurolidine was used. Protective measures that have been suggested included careful surgical procedure, followed by placement of the

specimen in a bag before extraction through a protected wound site, and tumoricidal washouts of the abdominal cavity (71).

Laparoscopically assisted colon resection is technically feasible for both benign and malignant disease. In the present study, there were only 2 patients who presented with features of Ileo-caecal tuberculosis and were subjected to laparoscopic assisted right hemicolectomy successfully. We did not attempt this procedure for any malignant disease.

In our study both the patients were positioned supine on the table with 15° tilt on left side for Right hemicolectomy while modified lithotomy position was utilized by Geis WP et al (72) as against supine position in the study by Lezoche et al (45).

We utilised 5 ports were utilized, first umbilical 10mm port, second - suprapubic 5mm third - Epigastric 10 mm port and fourth left hypochondrium 5 mm port and 10 mm port in left iliac fossa which is comparable to port sites utilized by Geis et al (72).

In our study, with the help of harmonic scalpel, all the mobilization of caecum, ascending colon hepatic flexure was done and intracorporeal mesenteric vessel occlusion was performed with the use of harmonic scalpel. Later, the mobilized segment was delivered out through the incision proposed and extracorporeal resection and anastomosis was done. While in the studies by E. Lezoche et al (45) and CA Anderson et al (72), after the mobilization of the required segment, intracorporeal ligation of the mesenteric vascular pedicle was obtained using endoscopic linear stapling device, and later the segment was delivered out for definite resection and anastomosis. However vessel ligation can be done with intracorporeal knotting.

The site of incision for specimen retrieval in our study was a 2-3" incision placed transversely, midway between right subcostal margin and anterior superior iliac spine which was similar to the study by Geis et al (72) while in the study by CA Anderson et al (73) it was just right to the umbilicus.

Present study done for right hemicolectomy for Ileocaecal tuberculosis recorded a mean operative time (in minutes) as 72 min as against 45 min for open procedure (by the same surgical team). As there was no study found to have done work on the same topic so comparison was done with laparoscopic assisted right hemicolectomy for colon carcinoma in the study by CA Anderson et al (73). Latter study reported the time as 166 min ± 40 min (73). While the time reported in a case of totally laparoscopic right hemicolectomy for colon carcinoma in the study by E.Lezoche et al (45) was 192 min.

Present study did not require any conversions as comparable to studies by CA Anderson et al (73) and E. Lezoche et al (45).

Our study had no significant complications in the post operative period. CA Anderson et al (73) reported no port site metastasis while in the study by E. Lezoche et al (45) - 1.9% patients experienced prolonged ileus and underwent reoperation and 2.7% patients developed a metastasis at the site of right subcostal port 6 months after undergoing palliative laparoscopic right hemicolectomy.

Average duration of hospital stay in our study was 8 days which is comparable to studies for laparoscopic assisted and totally laparoscopic right hemicolectomy for colon cancer as 8.3 days (73) and 9.2 days (45) respectively.

Summarising, on the basis of studies, a number of advantages have been shown when comparing laparoscopy to laparotomy for colorectal surgery including, in the former instance, less trauma to immune system, less adhesions formation, improved cosmesis, less depressed pulmonary function, and less post operative pain. Subjective improvements for the patients include an earlier return to a normal diet, a shorter hospital stay, and a more rapid return to a partial and full activity and employment for laparoscopy procedure patients than for laparotomy patients.

However, the applications of the laparoscope for the cure of the colorectal malignancy should be approached with cautions, and critical enthusiasm. We must

fulfill the most important part of the Hippocratic Oath : "Primum non nocere - first, do no harm ".

Laparoscopic Appendectomy

In the 1970s Laparoscopy was used as a diagnostic tool in patients with suspected appendicitis. Laparoscopic appendectomy was first described in 1983 and now has become the treatment of choice in appendicitis. There are perceived advantages in performing laparoscopic appendectomy (LA) in patients with suspected appendicitis. These include improved cosmesis, thorough examination of the peritoneal cavity with lavage and suction of infected peritoneal fluid, improved diagnostic accuracy (particularly in young fertile women), reduced exposure to patient's blood and secretions, resulting in a reduction in abdominal and pelvic adhesions. Recent published studies comparing open and LA suggest that LA may offer advantages over the open technique by reducing postoperative pain, morbidity, inpatient hospital stay and a possible earlier return to work (41-44, 52) and more important causing lesser long term morbidity in mainly two groups of patients i.e. – young fertile females and patients with suspected appendicitis.

Appendectomy is one of the most common surgical procedures. However, the reported rate of appendectomy of normal appendices, using the open procedure, varies from 10-30% (53). The rate may be as high as 40-50% in females of reproductive age (54). An improvement on the unfavourable rate with the open procedure can be achieved by laparoscopy (55). But the converse is also true and there are reports of an actual increase in the number of normal appendectomies during diagnostic laparoscopy.

Laparoscopy improved diagnostic accuracy (56) for appendicitis. It allows the surgeon to examine the abdominal and pelvic cavity in detail particularly advantageous in cases of uncertain diagnosis and in young women of reproductive age. The laparoscopic technique also allows effective management of any other

pathology, particularly that prevalent in young women (57), without the wound extension needed in the conventional approach.

Prospective randomized trials have not shown an advantage of laparoscopic over open appendectomy for the treatment of male patients with suspected appendicitis. Laparoscopy has been recommended in men in selected cases where the diagnosis is uncertain, or the patient is obese (58). Obese patients generally require larger incisions for standard exposure with open technique ; therefore the laparoscopic technique has obvious advantage in this group.

The extent of inflammation of the appendix can also play a role. Laparoscopic management of perforated appendicitis or appendicular lump may be superior to the open approach (60). In these cases, blunt dissection of the adherent omentum and bowel loops can be achieved under direct vision. Suction and irrigation of the peritoneal cavity and pelvis can be performed, and drains can be inserted through one of the port sites. This when compared to open intervention has obvious advantage of a decreased incision morbidity.

In the present study, 11 patients presented with features suggestive of **Recurrent Appendicitis** or **Appendicular lump**(55% of total patients included in this study).

Out of 11 cases, laparoscopic appendectomy was done successfully in 7 cases while in 2 cases laparoscopic assistance was required (due to dense adhesions).

In all the cases, patient was positioned supine on the table as in the studies of JTT Tate et al (42), O. Tucker et al (43) while in the series by JA Mompean et al (41) – the position was supine with 15°turned to the left and in the study by Attwood et al (44) it was trendelenberg position with 15° turned to left.

In our study, 3 ports were used : a supraumbilical one of 10 mm for the laparoscope, one of 10 mm in the left iliac fossa and third of 5mm in midline suprapubic region as in the case of Attwood et al (44), JTT Tate et al (42),

Mompean et al(41) where 3 ports were used but the third 5mm port was placed below the right costal margin in the mid clavicular line.

Present study recorded a mean operative time (in minutes) for LA as 20 min for open method which was much less as compared to their studies.

		Lap	**Open**
1. O. Tucker et al(43)	–	63.3 min	-
2. SEA Attwood et al(44)	–	61 min	50 min
3. JA Lujan Mompean et al(41)	–	51 min	46 min
4. JJT Tate et al(42)	–	75 min	47 min

Although, in the current study, no conversion was required in any case subjected to laparoscopic technique, assitance was needed in 2 cases (due to dense adhesions) comparable to the study by Kum et al (52) – 0%, as against 5% in Mompean et al (41), 6% in Attwood et al (44), 8% in Tate et al (42) and 2% in Tucker et al (43).

The present study showed the average duration of hospital stay (HS) as 2 days which was comparable to studies by Tucker et al (43) – 2.3 days, Attwood et al (44) – 2.5 days as against 3.2 days in study by Kum et al (52), 3.7 days in Tate et al (42) and 4.8 days in the study by Mompean et al (41).

The present report recorded no significant complications (like wound infections, hematoma, intraabdominal abscess) in the post operative period as comparable to studies by Attwood et al (44) and Kum et al (52) while the percentage of complications in other studies were as 3%, 5 % and 8% in Tucker et al (43), Mompean et al (41) and Tate et al (42) respectively.

In summary, when comparing laparoscopic and open appendectomy, there were similarities in anaesthetic times, postoperative mobidity and analgesic requirements but laparoscopic technique has an upper hand in certain patients with a suspected diagnosis of appendicitis (61), particularly in young fertile female (57), obese male patients (59) and patients with perforative appendicitis or appendicular lump (60). It is an important diagnostic tool particularly in young women with suspected appendicitis,as other pathologies of pelvic organs like salpingitis/oopheritis mimicking appendicitis can be easily ruled out.

Laparoscopic Rectopexy

The advent of laparoscopic surgery has changed the technical, but not conceptual, approach to many abdominal operations including for rectal prolapse. Patients who must undergo transabdominal operations for the treatment of rectal prolapse are the ideal candidates for the application of laparoscopic surgery. Elderly patients who previously were deemed unfit for abdominal surgery may be candidates for laparoscopic abdominal procedures such as rectopexy and anterior resection(30). Operations for rectal prolapse that are approached laparoscopically include anterior resection, proctopexy, and abdominal perineal resection. Perineal rectosigmoidectomies can also be performed with laparoscopic assistance.

Rectopexy is the most frequently performed laparoscopic operation for the control of rectal prolapse. All the steps of the equivalent open operation ie mobilization of the rectum to the pelvic floor with preservation of the presacral nerve, division of the lateral sacral ligaments and posterior rectopexy, can satisfactorily be accomplished laparoscopically. Intraoperative complications have been limited to minor bleeding, which can be easily addressed by converting to an open procedure if necessary. The incidence of deep venous thrombosis may increase especially in patients in a Llyod-Davies position with flexed legs(32). The position of the patients during surgery, the high intraabdominal pressure and the length of the procedure may all contribute to the development of this complication. The Llyod-Davies position, although helpful, is not strictly necessary for laparoscopic rectopexy and patients are now placed supine for pelvic laparoscopic procedures as is our practice and especially in those that do not involve endoanal manipulation. There are no published data on the incidence of post operative DVT in patients undergoing laparoscopic colorectal surgery.

In our study, only one patient of rectal prolapse was subjected to laparoscopic mesh rectopexy .

Patient was positioned supine on the table with head down tilt in our study as compared to Llyod-Davies position in the study by Ballantyne et al (32).

Regarding the number of ports used for rectopexy, we placed 4 ports – a 10mm supraumbilical for camera, 10 mm port in the right iliac fossa, 10 mm port in epigastrium and 5 mm port in the left hypochondrium as opposed to five ports

used in the study by Ballantyne et al (32) – where all the ports were placed in the infraumbilical region.

Our study recorded the mean operative time (in minutes) for laparoscopic rectopexy as 80 min as compared to 40 minutes in open approach. The time taken in our study in the laparoscopic procedure was remarkably less as compared to average of 3.6 hrs recorded by A. Cuscheri et al (47) and 198 minutes by Solomon et al, 1996 and 150 minutes in the study by Kellokumpu et al (48).

Average duration of hospital stay after the laparoscopic rectopexy in our study was 5½ days as compared to 5 days in the study of Kellokumpu et al (48), 4 days by Cuscheri et al (47) and 6.3 days in the study by Solomon et al, 1996.

Our patient had no significant intra-operative or post-operative complications as against the study of Cuscheri et al (47) where one of the five patients was readmitted after 3 days of discharge with a left ileofemoral thrombosis while Solomon et al, 1996 report 1 patient with port site hernia and another was converted to open among total of 21 patients.

The laparoscopic rectopexy is therefore a safe and effective option for the treatment of rectal prolapse. It is less invasive than an open rectopexy procedure with decreased post operative disability.

Conclusion

CONCLUSION

Present study was conducted in the Department of Surgery, MLB Medical College, Jhansi over a period of one year including 20 patients of different non-acute intestinal pathologies.

Following conclusions were drawn from this study :-

- The commonest non-acute intestinal pathology was Recurrent Appendicitis (8 cases; 40%).
- Majority of the cases were seen in the age group 10-25 years (55%).
- Male to Female ratio was 0.81.
- The commonest symptom was Pain in abdomen which was found in 19 patients (95%), followed by Nausea/Vomiting (10 patients, 50%).
- All the 20 cases were subjected to therapeutic laparoscopic interventions.
- Mean operative time (in minutes) for different laparoscopic procedures were as follows :-

  Lap. Appendectomy – 23 min.

  Lap. Adhesionolysis – 30 min.

  Lap. Rectopexy – 80 min.

  Lap Assisted Right Hemicolectomy – 72 min.

- Average duration of Hospital Stay (in days) in different procedures:-

  Lap. Appendectomy – 2 days.

  Lap. Adhesionolysis – 4 days.

  Lap. Rectopexy - 5½ days.

  Lap. Assisted (R) Hemicolectomy – 8 days.

- Approximate number of painkiller injections given in the post-operative period

  Lap. Appendectomy – 3 ampoules.

  Lap. Adhesionolysis – 3 ampoules.

  Lap. Rectopexy – 5 ampoules.

  Lap. Assisted (R) Hemicolectomy – 6.5 ampoules.

- None of our cases subjected to laparoscopic intervention needed conversion.

- None of our cases had significant intra operative or post operative complications.

The advent of laparoscopic techniques for various intraabdominal procedures, other than cholecystectomy, has revolutionized surgery. Almost all the procedures, which once were being done as open procedures are now possible with less trauma to the patient laparoscopically.

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Summary

SUMMARY

In the 21st Century, Laparoscopy no longer occupies a small niche in general surgery. In fact, it is estimated that currently more than 30% of all abdominal surgery are performed laparoscopically. As new laparoscopic procedures are perfected, many experts believe that within the next few decades nearly 80% of all abdominal surgeries will be performed using laparoscopic techniques.

The study was conducted on patients presenting with signs and symptoms suggestive of any non-acute intestinal pathology in the out-patient department of MLB Medical College, Jhansi in the Department of Surgery over the past one year.

Later the patient included in the study were divided into 2 categories :-

I – Those undergoing therapeutic laparoscopic intervention.

II – Those subjected to open surgical procedures.

AIM OF STUDY

The basic aim of the conducted study over the last year was to compare and analyse the results of patients under group I with those of group II in terms of:-

a. Feasibility
b. Alternative feasibility of assisted laparoscopic intervention
c. Operative time
d. Post operative pain relief
e. Discharge time
f. Return to work time.
g. Complications

All the patients were subjected to therapeutic laparoscopic interventional procedures.

Following conclusions were drawn from this study :-

- The commonest non-acute intestinal pathology was Recurrent Appendicitis (8 cases; 40%).
- Majority of the cases were seen in the age group 10-25 years (55%).
- Male to Female ratio was 0.81.
- The commonest symptom was Pain in abdomen which was found in 19 patients (95%), followed by Nausea/Vomiting (10 patients, 50%).
- All the 20 cases were subjected to therapeutic laparoscopic interventions.
- Mean operative time (in minutes) for different laparoscopic procedures were as follows :-

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- Average duration of Hospital Stay (in days) in different procedures:-

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  Lap. Assisted (R) Hemicolectomy – 8 days.
- Approximate number of painkiller injections given in the post-operative period

  Lap. Appendectomy – 3 ampoules.

  Lap. Adhesionolysis – 3 ampoules.

  Lap. Rectopexy – 5 ampoules.

  Lap. Assisted (R) Hemicolectomy – 6.5 ampoules.

- None of our cases subjected to laparoscopic intervention needed conversion.

None of our cases had significant intra operative or post operative complications.

The next important area for development may be the human-computer interface systems, which will greatly expand the sense of being able to perform laparoscopic surgery with the same tactile sense as open surgery. This will take significant investment and research but would represent a meshing of technologic advances that has unlimited potential. At least for today's surgeon the sky is the limit for creative enterprise, so let us seize the moment and move our specialties forward in a way and on a scale that may not happen again for many generations.